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The Effects of Social Ties and Interdependence on Social Network Game Player Behavior: A Research-in-Progress

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Abstract: A Social Network Game (SNG) is a type of online game which is operated mainly through social networks. Recently, the SNG has enjoyed dramatically growth worldwide. Aiming at understanding game players' motivation and gaming experience, this study proposes a theoretical model that explores the roles of social tie and interdependence on gaming experience and responses. Self-efficacy and group effectiveness are chosen as criteria to measure game-players' responses. A laboratory experiment was designed to manipulate SNG interdependence structure (task interdependence and reward interdependence) and social tie and collect data. Present paper also discusses the potential theoretical and practical implications.

Keywords: social ties, interdependence, social online games, self-efficacy, group effectiveness

1. INTRODUCTION

In recent years, the online gaming industry has developed dramatically. The total revenue of China online gaming market has added up to 89.16 billion Yuan in 2013[1]. By June 2014, the population of online game players in China had come to 368 million [2]. Besides, today's online game players are willing to spend more expense on online games, for the growth of GDP per Chinese person. It's not surprising that online game industry is becoming more attractive for Internet giants [1]. In fact, social networking games (SNGs) are one of the most popular games played around the world [1].

A Social Network Game (SNG) is a kind of online game which is operated mainly through social networks and which typically possess the features of multiplayer and asynchronous game-play mechanics [3]. Such games provide players a platform to communicate and interact with other players [4]. Compared to traditional online games, the social elements, such as social ties and interdependence, which can be embedded in online games by computer-mediated communication (CMC) technologies play a significant role in attracting online game players and making them enjoy better game experience.

In term of game design, the availability of manipulating the social elements in the course of designing SNGs provides SNGs developers new opportunity in improving game experience and involvement. Understanding the rules of game players' interacting and collaborating with other players, i.e., the game interdependence structure and social tie among game players, are the key to the successful SNGs. Nevertheless, the interdependence structure is largely absent from prior SNG gaming behavior research. Interdependence exists when "the outcomes of individuals are affected by each other's actions"[5]. Interdependence is associated with individuals' cooperation and willingness to effort [6]. Therefore, our first objective is to integrate interdependence in analyzing SNG gaming behavior in our research model.

Related to the need for collaboration and communication in social networking games, another key element of SNGs might be the relationship among game players. The relationship between players can be divided into two forms: strong ties and weak ties [7]. The relationships between friends related with trust and closeness are often regarded as "strong" ties while "weak" ties mostly involve acquaintances and strangers [7]. According to the conceptually related media multi-plexity theory of Haythornthwaite [8], strong ties tend to take shape due to

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the use of different media for relationship maintenance, while weak ties are often formed via a single medium. However, social online games, like other computer-mediated communication (CMC), are mostly are supposed to only cultivate weak ties [9]. Thus, the inconsistent theories indicate social tie is one of the critical elements that should be harnessed in researching social games. How to control the cooperation and social ties between gamers to improve gamers' intention to play online games should be taken into account for game developers.

The objectives of this research are to complement current literature on SNGs by integrating interdependence and social ties in analyzing SNG players' behavior. Specifically, we identify two types of interdependence, i.e., task interdependence and reward interdependence on players' group performance and players' self-efficacy in playing online games. Further, social ties among game players are also supposed to be a key factor to affect online game behaviors. This study contributes to the literature by identifying the important but neglected SNG characteristics, i.e., interdependence structure and social tie. We develop a conceptual framework based on the theories of interdependence and social tie to explicate the understudied factors of SNG players. We suggest that relationships between task interdependence and reward interdependence are valuable [6]. The constructs related to social tie and reward types are conceptualized toward social games design strategies. On the other hand, while prior studies have examined the main factors of motivating people to play online games or affecting the players' game performance, no empirical effort has been put into investigating the relationship between social tie and interdependence on game players' responses. This study goes beyond previous studies by exploring the interaction effects of three underlying factors: 1) social tie between SNG players; 2) players' interdependence; 3) the interaction effect between social tie and interdependence. This provides deeper understanding of the impacts of SNG characteristics on players' group performance and players' intention to play online games, and sheds insights on the considered elements of social game design. By addressing these issues, we offer both theoretical and practical implications on SNG marketing.

2. LITERATURE REVIEW AND THEORETICAL DEVELOPMENT

2.1 Interdependence

Interdependence refers to the degree to which a person depends on or relates to others. Interdependence exists when "the outcomes of individuals are affected by each other's actions" [5] and facilitates the group formation [10]. In a group, work can be highly interdependent, i.e., group members have to accomplish their own task which is necessary for group goal [6]. For example, a management team requires group members to depend on each other to conduct the complete product line, including developing, producing, and marketing a new product [6]. The interdependence dimensions influence the group members' sense of responsibility and personal performance. More specifically, the interdependence dimensions differ experienced responsibility for the others' work and, to a certain degree, account for the variance in team members' personal work performances [11]. In SNGs, the scope of interdependence consists of interpersonal collaboration for fulfilling joint tasks, necessary help among ream members, the involvement in virtual communities in favor of common goals, etc[4].

Task interdependence and reward interdependence

Task and outcome interdependence are two basic forms of interdependence, working simultaneously within a team [12]. Task interdependence refers to the degree to which an individual's task performance relys on others' work abilities or willingness of effort [6] [13] and appears when all kind of resources including materials, information, and suggestions must be share by team members for the accomplishment of the desired outcome [11]. Task interdependence can vary from none to very high. Task interdependence does not exist within an individual task which can be taken by one person. The highest level of task interdependence happens in a collective task whose fulfillment depends on multiple individuals [13].

Reward interdependence means the degree to which rewards accorded to an individual are decided by the

performances of individuals' teammates. The most interdependent reward system is presented when the measures of reward are based on joint performance rather than on individual performance. By contrast, the least interdependent reward system is the one in which what is earned by members replies on individual performance [13]. In present research, Similarly, if the reward of group performance is decided by the performances of both partners in a pair, the reward interdependence would be regarded to be strong while the degree of reward interdependence can be said to be weak on the condition that either one of two partners decides the group performance.

2.2 Social tie

Social tie connecting a pair of actors can consist of one or more relations. Namely, pairs may maintain a tie with one relation only—colleagues among whom only work relation exists, or a multiplex tie with many relations—members who not only share information but exchange emotional support [14]. The strength of an interpersonal tie is one of the fundamental features of social tie [15]. According to Granovetter, tie strength is defined as follows: the strength of a tie is associated (probably linearly) with the amount of time, the emotional magnitude, the intimacy (reciprocal trust), and the mutual support that feature the tie [16]. Thus, ties are often distinguished as weak or strong. Weak ties involve non-intimate connections which less time is invested to. Strong ties are a conjunction of intimacy, self-disclosure, mutual support, frequent contact, and kinship existing between close friends or acquaintances [14]. Domahidi, Festl and Quandt found that social online gamers are well connected and utilize the game to contact with old friends—and to make friends with strangers [17]. Their results indicate that the story happening between the two parts tends to support the emergence of strong ties. That is, friendship between gamers formed if they kept in touch through the game on a more or less regular basis [17]. However, there are some conflicts existing in some extant studies. Ducheneaut et al. found that social online games are mostly suggested to cultivate only weak ties [9]. In our research, if the partners are friends before experiment, their relationships are beyond the experimental partners (i.e. there are more than one kind of relations between them) and they are apt to form strong social tie. If the partners do not meet each other until the experiment (i.e. there is only one kind of relation, I.e., game partners, connecting them), the relationship between the pair will be defined as weak tie.

3. HYPOTHESES DEVELOPEMENT

3.1 Dependent variables

Self-efficacy

Based on social cognitive theory, the motivation to directly affect individuals' activities may be influenced by self-efficacy for teamwork [18]. Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" [18]. Self-efficacy for teamwork indicates an individual's perceived ability of decent performance in a context where cooperation and coordination among peers are necessary [18]. Locke theorized that self-efficacy beliefs, matching with goals, set up the "motivational hub," which reflects the mechanics that most directly affect action [19]. Research concordantly suggests that self-efficacy beliefs, to a large extent, conduce to an individual's motivation and performance [20]. Since self-efficacy has an effect on the motivation to engage in specific activities, self-efficacy for teamwork may reflect the level of the contribution an individual devoted to others' tasks [18]. Obviously, the more experienced player who believes he/she can contribute more to the game performances is more likely to be motivated by self-efficacy than the less experienced one.

Group effectiveness

Effectiveness is involved in the following components: (1) the number of group's work outcome equals or exceeds the requirements of the users; (2) group members work together in ways which can improve the

efficiency of the group over time, learn from each other and form regulation of maintaining high-quality performance; and (3) the group experience, in general, meets the needs of the members [6]. In SNGs, we took example from above effectiveness dimensions and defined the SNG group effectiveness as the following three aspects: (1) the game performance (game scores or other quantizable outcomes) equals or exceeds the requirements of the game players. (2) the group members' interaction helpful to improve game performance and (3) the group experience generally exhilarates rather than frustrates game players' expectations for SNGs.

3.2 Independent variables

Interdependence: Task interdependence is defined as the degree to which an individual's task performance is decided by other members' abilities or the efforts they are willing to invest [6] [13]. In the context of social online game we study， interdependence refers to the cooperation of game partners (a pair) that is necessary to complete the tasks. On the other hand, reward interdependence means the extent to which the rewards that are distributed to an individual rely on coworkers' performance [13]. In present research, the reward interdependence of social games mainly refers to the calculation system of the game reward that is based on the weighted average of the performances of the two partners in a pair.

Work teams consist of members depending on each other for the successful completion of their individual tasks. Thus, each member is assumed to have the motivation to facilitate the work of other team members [11]. Interdependence is one of the most important features of "social" game in which players are provided a platform to communicate and interact with other players. Therefore, it is presumably that the increase of task interdependence can promote more effective cooperation, better performance, and increased efficiency [11]. Thus, we hypothesize that

H1a,b: High task interdependence leads to high (a) self-efficacy and (b) group effectiveness.

It is suggested that group members under positive circumstances (i.e., a team member is convinced that goal attainment by other team members contributes to the realization of his or her own goals), in contrast to negative ones, are more open-minded for each other's arguments and desires, give other members' performances more concern, and circulate more kills and resources [11]. When a pair of game partners completes a task together, one of them believe the other's effort can contribute to their common goals. It is presumably that, under the SNG environment of positive, high reward interdependence can facilitate the resource exchanges between pairs, such as game experiences and mental supports, and trigger greater intention of players to play online games. Therefore, we proposed that

H2a,b: High reward interdependence leads to high (a) self-efficacy and (b) group effectiveness.

A higher level of task interdependence does not always bring more benefits, however. Task interdependence can, in fact, lead to a situation that decreases the willingness of other team members to make efforts [21]. The extant research shows that the impact of task interdependence (positive or negative) on the effectiveness of team members is in conjunction with the type of outcome interdependence (high or low interdependence). Namely, the type of outcome interdependence is able to moderate the relationship between the degree of task interdependence and the effectiveness of team members [11]. Thus, we hypothesize that

H3a: In SNGs, reward interdependence moderates the relationship between task interdependence and self-efficacy, such that when reward interdependence is high, the relationship between task interdependence and self-efficacy will be stronger than when reward interdependence is low.

H3b: In SNGs, reward interdependence moderates the relationship between task interdependence and group effectiveness, such that when reward interdependence is high, the relationship between task interdependence and group effectiveness will be stronger than when reward interdependence is low.

Social tie: Since self-efficacy influences the motivation to engage in some specific activities, self-efficacy for teamwork may reflect the level of the contribution an individual devoted to others' tasks [18]. Taggar &

Haines III argued that an individual's self-efficacy for teamwork can be affected by their collectivist orientation [22]. Several researchers have taken some examinations which told us that collectivist tendency as a within-culture personal characteristic exerted a significant influence on group cooperation [23], member motivation [24], and preference for community interaction and social support [25]. On the condition of high interdependence (both task and reward), a pair of players who are friends is more likely to produce individual's collectivist orientation, which catalyzes the form of self-efficacy and then motivates players to engage games more.

H4a: In SNGs, social tie moderates the relationship between task interdependence and self-efficacy, such that when social tie is strong, the relationship between task interdependence and self-efficacy will be stronger than when weak.

H4b: In SNGs, social tie moderates the relationship between reward interdependence and self-efficacy, such that when social tie is strong, the relationship between reward interdependence and self-efficacy will be stronger than when weak.

4. METHODOLOGY

4.1 Experimental design

A laboratory experiment was designed to test the hypotheses. We used a 2 (task interdependence: high versus low) × 2 (reward interdependence: high versus low) × 2 (tie strength: strong versus weak) between-subject factorial design. The subjects will be randomly selected to take the eight treatments in the experiment. We receive the support from a game developer firm which agrees to provide their newly developed online game as our experiment platform and customize the game for our experiment purpose.

4.2 Manipulations

We defined an interdependent task as one in which one individual's the actions could affect another person's performance. Accordingly, task interdependence was designed by altering the extent to which one member of a pair could utilize some unique game knowledge to help the game partner complete the game task. We provided each subject in the pair with specialized training, and distinguished the task to make the value of making use of the other's unique knowledge under different levels among pairs [13]. Reward interdependence was manipulated by constructing different the reward structures for each pair of participants. We manipulated reward interdependence by the calculation system of the game reward that is based on the weighted average of the performances of the two partners in a pair. The calculation model will be a function, such as A=a+k*b (A is the whole performance; a & b are the two partners in a pair; k is a changeable factor by which the reward interdependence can be adjusted.), which was used in the experimental SNG.

The online pre-experiment survey required participants to list five of their closest friends. We manipulate tie strength by considering the relationships of participants with that of the listed contacts on the experimental SNG. We categorized the level of task interdependence of the participating pairs in two stages: the tie between a pair and the tie between pairs presented in ranking board. The former is a kind of individual-to-individual relationship. The tie between the partners in a pair who are friends is viewed as strong tie while the tie between strangers in a pair is defined to be weak. The latter refers to a pair-to-pair concept. When the performances of all pairs are demonstrated in the ranking board, if neither one in a pair got to know either person in another pair, the tie between the two pairs is regarded as weak; if either (or both) of partner of a pair is a friend of either (or both) of partner of another pair, the tie between the two pairs is strong.

For manipulation check, tie strength was measured by capturing participants' reported relationship quality against the game players presented in the experiment. The measures were adopted from Brown and Reingen [26], and three terms are taken into account, including the importance of the social relation, frequency of social

contact, and type of social relation [16][27]. The measures for interdependence were adapted from Kiggundu (Table 1), which measured the extent to which the task and reward of one partner depend on the other one [28]

Table 1. Interdependence Instruments

No.	Task Interdependence
1	My own performance dependence on receiving information and advice from my partner
2	I depend on my partner's work for materials and/or requisites that I need to complete my game task.
3	I depend on my partner's work for help and support that I need to complete my game task.
4	I depend on my partner in order to be able to complete my game task well.
5	My game performance is strongly affected by my partner's game performance.
No.	Reward Interdependence
1	It is beneficial for me when my partner excel in his game task
2	It pleases me when my partner excel in his game task
3	My partner's goal is compatible with mine
4	It is to my advantage when my partner performs well

4.3 Dependent variables

The measures for group effectiveness were adapted from Wageman [6]. Group effectiveness could be evaluated by (1) archival data about group performance; (2) survey and archival measures of the degree to which members interact in ways that improve the work efficiency over time—including member learning, quality of interaction processes; and (3) survey measures of motivation and satisfaction of personal work [6]. In this study, SNG Play Self-Efficacy Scale (SPSES) was developed for this study and the items deal with an individual's belief in their own capability to involve in SNGs. According to various self-efficacy scales, (e.g. Job Readiness Self-Efficacy Scale (JRSE) [29], Computer Self-Efficacy Measure [30], the instrument (see Table 2) includes 5 items.

Table 2. Self-Efficacy Instruments

No	Items
1	I am confident in my ability to get along with my game partners.
2	I am confident in my ability to play SNGs if my partner does not tell me what to do.
3	I am confident in my ability to play SNGs even if I had never played this type of SNG.
4	I am confident in my ability to play SNGs if I could call my partner for help if I got stuck.
5	I am confident in my ability to play SNGs if my partner had helped me get started.

Based on the scale used by Van der Vegt & Van der Vliert [11], our study measure group effectiveness with 9 items (Table 3).

Table 3. Group Effectiveness Instruments

No.	Items	No.	Items
1	Confidence with regard to being on good terms in the future	6	Increased workload, resulted in more work
2	Positive feelings about the way we work together	7	Feeling good about relationship with colleague
3	Wasted time and man hours	8	Completely trust colleague
4	Dissatisfied about the way we work together	9	Increased efficiency, effectiveness
5	Strengthened relationship with other party		

5. CONCLUSION AND EXPECTED CONTRIBUTIONS

As SNGs continue to enjoy a popularity and attract more game players, it is imperative for game designers

to gain insights into what factors of SNGs work best to motivate players to engage in SNGs and improve the group effectiveness of game partners. SNGs allow players to build interpersonal connections among their social networks, leading to a new channel of investigating the function of the social tie in the online game world. We expect to find the moderate function of reward/task interdependence for the relation between task/reward interdependence and the self-efficacy game-players experience. Besides, this study took social tie into account in the context of SNGs. In other words, interdependence can leverage on social tie to exert influence over game-players' intention. These findings provide some instructions to game designers. The self-efficacy and group effectiveness of the game players vary with different levels of interdependence (task and reward). If an organization creates team-based game designs, a desirable interdpendence structure of SNG can win more loyalty game-players and contribute to its marketing.

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